

PHASE II WORK PLAN
FOR
**THE MONTGOMERY TOWNSHIP HOUSING DEVELOPMENT/
ROCKY HILL MUNICIPAL WELLFIELD SITE**

Submitted to
NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Waste Management
Hazardous Site Mitigation Administration
CN 028
Trenton, New Jersey 08625

April 1987
84C4007-A

Submitted by
WOODWARD-CLYDE CONSULTANTS
201 Willowbrook Boulevard
Wayne, New Jersey 07470

TABLE OF CONTENTS

	<u>Page</u>
SECTION 1 INTRODUCTION	1
SECTION 2 SOIL INVESTIGATION	3
SOIL BORINGS	3
SAMPLING PROCEDURES AND CHEMICAL ANALYSES	3
SECTION 3 MONITORING WELL INSTALLATION	8
SECTION 4 POTABLE WELL SAMPLING	10
SECTION 5 MONITORING WELL SAMPLING	12
SAMPLING PROCEDURES	12
SECTION 6 SURFACE WATER AND SEDIMENT INVESTIGATION	14
SAMPLING LOCATIONS AND RATIONALE	14
SAMPLING PROCEDURES AND CHEMICAL ANALYSES	14
SECTION 7 SEPTIC TANK SAMPLING	16
SAMPLING PROCEDURES AND CHEMICAL ANALYSES	16
SECTION 8 AIR SCREENING	17
AMBIENT AIR SAMPLING	17

LIST OF TABLES

<u>No.</u>	<u>Title</u>
2-1	PROPOSED SEPTIC TANK SAMPLES AND LEACH FIELD BORING LOCATIONS
2-2	PROPOSED 20-FT SOURCE BORINGS
4-1	ROUND TWO POTABLE WELL SAMPLES

LIST OF FIGURES

<u>No.</u>	<u>Title</u>
2-1	BORING AND MONITORING WELL LOCATION PLAN
3-1	DEEP MONITORING WELL CONSTRUCTION
3-2	SHALLOW MONITORING WELL CONSTRUCTION

SECTION 1 INTRODUCTION

The Montgomery Township Housing Development (MTHD) and the Rocky Hill Municipal Wellfield (RHMW) are located in Somerset County, approximately one mile apart from each other. The Housing Development is a 72-acre development consisting of 71 homes, each with its own private well and septic tank. The area to the north consists of wooded and agricultural lots.

The Rocky Hill Municipal Wellfield is a 2-acre tract of land situated to the south of the Montgomery Township community. A number of industrial and commercial establishments are located to the west and southwest of the MTHD and RHMW and the Princeton Airport is located southwest of these areas.

The major environmental concern at this site is contamination of the ground water with trichloroethylene (TCE) and other halogenated volatile organic compounds. The source of this contamination remains unknown. All of the 71 residences at the site have private wells which are opened in the Brunswick Shale Formation. Since ground-water contamination was detected, 29 homes have been connected to the Elizabethtown Water Supply, while wells at 30 other residences that have shown water contamination, including an additional three residence wells immediately adjacent to the development, continue to draw water from the Brunswick aquifers. Volatilization of these contaminants within the homes could be a potential problem.

Analysis of well water in the MTHD indicate that TCE levels range from 50 to greater than 150 ppb (the highest level was 640 ppb) in the southern portion of the development and range from 0 to 50 ppb in the northern portion. Well No. 2 of the RHMW has contained TCE levels as high as 365 ppb. Other potential contamination sources in the affected areas have shown varying levels of TCE

contamination in the ground water. TCE was detected in the septic tanks of commercial or industrial establishments at 6 to 13 identified potential sources. Septic tanks have not been sampled in the MTHD to date.

The purpose of this investigation is to conduct a Remedial Investigation and Feasibility Study (RI/FS) for the Montgomery Township Housing Development/Rocky Hill Municipal Wellfield site. The objectives of this study include: determining the types and concentration of hazardous substances present; the areal extent of contamination; and the development and evaluation of remedial alternatives to determine the most cost-effective and environmentally sound remedial action for the site.

This Field Sampling Plan defines sampling rationale, protocol and locations and identifies tasks and procedures to be conducted during the second phase of field investigations. References have been made to other documents developed by Woodward-Clyde Consultants (WCC) specifically for this site and include the Health and Safety Plan (HASP) and the Quality Assurance Project Management Plan (QAPMP) both of which have been submitted to the New Jersey Department of Environmental Protection (NJDEP).

SECTION 2

SOIL INVESTIGATION

SOIL BORINGS

The soil investigation program planned for the site involves obtaining soil samples by sampling continuously with a split-spoon sampler from the ground surface. Thirteen holes are planned to be drilled at the perimeters of septic leach fields (Figure 2-1, Table 2-1). These borings will reach a total depth of 12 ft below the ground surface or to split-spoon refusal. Most of the borings will be made with a truck-mounted auger drill rig. The five borings to be bored on domestic sites may be made using a motorized cathead hoist and tripod.

Twenty-two borings will be drilled to a total depth of 20 ft below the ground surface or to split-spoon refusal. Four of the deeper borings will be drilled at the perimeters of septic leach fields (Table 2-2).

SAMPLING PROCEDURES AND CHEMICAL ANALYSES

The procedures that will be followed during boring advancement and sampling are identified in the WCC Standard Operating Procedure (SOP) Number 4.0 in Appendix A of the QAPMP. A WCC geologist will inspect the drilling and maintain an accurate geologic log for each boring.

A total of 59 soil samples will be sent for chemical analyses (not including quality assurance samples). Those samples to be analyzed will be selected based primarily on headspace analysis using an organic vapor analyzer equipped with a chart recorder. Headspace analyses will be performed on all samples at the end of each day. If no volatile compounds are detected during headspace analysis, then sample selection will be based on appearance. Samples showing signs of possible

contamination such as oily residue or discoloration would be a second choice for chemical analysis.

Each split-spoon sample will be divided into two fractions. One fraction will be placed in a geotechnical sample jar, covered with foil, capped, labeled and cooled on ice. This sample will be used for headspace analysis. The second fraction will be placed in a laboratory cleaned sample jar, labeled and cooled on ice. This sample would be sent for chemical analysis if headspace analysis reveals that it is relatively highly contaminated. Samples will be transferred from split spoons to sample jars using stainless steel spoons. These spoons and split spoons will be field decontaminated between samples. Field decontamination will consist of the following:

1. Alconox detergent scrub.
2. Potable water rinse (Rocky Hill Municipal Wellfield water).
3. Distilled-deionized water rinse.
4. 10% Nitric acid rinse*.
5. Distilled-deionized water rinse.
6. Pesticide-grade acetone rinse.
7. Air dry.
8. Distilled-deionized water rinse.

Two types of chemical analyses are to be performed on soil samples. Forty-eight samples will be analyzed for volatile organics and 11 samples will be analyzed for priority pollutants plus 40 additional peaks. The distribution of sample types is summarized in Tables 2-1 and 2-2.

Priority pollutant soil analyses require a volume of sample of more than one liter as opposed to 120 ml required for volatile analyses. Because of this,

* will only be used when sample is to be analyzed for metals

those borings where priority pollutant samples are to be collected will be advanced using 3-inch diameter split spoons and all others will be advanced with standard 2-inch split spoons.

MAY 001 0008

**TABLE 2-1
PROPOSED SEPTIC TANK SAMPLES*
AND
LEACH FIELD BORING LOCATIONS****

<u>Location</u>		Owner	Septic Tank Samples	Leach Field Boring Number
Block	Lot			
29002	8	Robinson - 85 Sycamore	1	SF-1
29002	14	Merritt - 22 Oxford	1	SF-2
29001	1	Beachell - 1501 Rte. 206	1	SF-3
		Not confirmed at this time	1	SF-4
		Not confirmed at this time	1	SF-5
29001	11	Van Cleef Engineering	1	SF-6
29001	8	Rocky Hill Realty	1	SF-7
28001	69	Village Shopper	1	SF-8
29001	8	Rocky Hill Realty	1	SF-9
29001	12	Phill's Gas Station <i>FORMER MOBIL</i>	0	SF-10
35001	2	Town and Country Animal Hosp.	1	SF-12
35001	1	Wm. Penn Gas Station	0	SF-13
34001	79	Princeton Volkswagon	1	SF-14
29001	14	Princeton Gamma Tech	1	
5	17	Compo Industries	1	

* One sample for volatile organic analysis will be collected from each septic tank.

** One soil sample from each boring will be analyzed for volatile organics.

**TABLE 2-2
PROPOSED 20 FT SOURCE BORINGS**

Boring Number	<u>Location</u>		Owner	<u>Samples</u>	
	Block	Lot		Priority Pollutant	Volatile +40 Organics
SB-1	29001	11	Van Cleef Engineering	1	1
SB-2	29001	11	Van Cleef Engineering	1	1
SB-3	29001	11	Van Cleef Engineering	1	1
SB-4	29001	11	Van Cleef Engineering	0	2
SB-5	29001	11	Van Cleef Engineering	1	1
SB-6	29001	8	Rocky Hill Realty	1	1
SB-7	29001	8	Rocky Hill Realty	1	1
SB-8	29001	8	Rocky Hill Realty	0	2
SB-9	29001	8	Rocky Hill Realty	0	2
SB-10	29001	8	Rocky Hill Realty	0	2
SB-11	29001	14	Princeton Gamma Tech	1	1
SB-12*	29001	8	Rocky Hill Realty	1	1
SB-13*	29001	8	Rocky Hill Realty	1	1
SB-14*	29001	8	Rocky Hill Realty	0	2
SB-15	29001	12	Thul's Gas Station	0	2
SB-16*	29001	8	Rocky Hill Realty	1	1
SB-17	28001	60	Tigers Tale	0	2
SB-18	28001	64	Texaco Gas Station	0	2
SB-19	35001	1	Wm Penn Gas Station	0	2
SB-20	34001	79	Princeton Volkswagon	0	2
SB-21	5	17	Compo Industries	1	1
SB-22	5	17	Compo Industries	0	2

* Leach field boring.

SECTION 3

MONITORING WELL INSTALLATION

Phase II activities at the MTHD/RHMW site include the installation of four new monitoring wells (MW-16, -17, -18, and -19) and the relocation of two wells installed during Phase I work (MW-11S and -11D) (Figure 2-1).

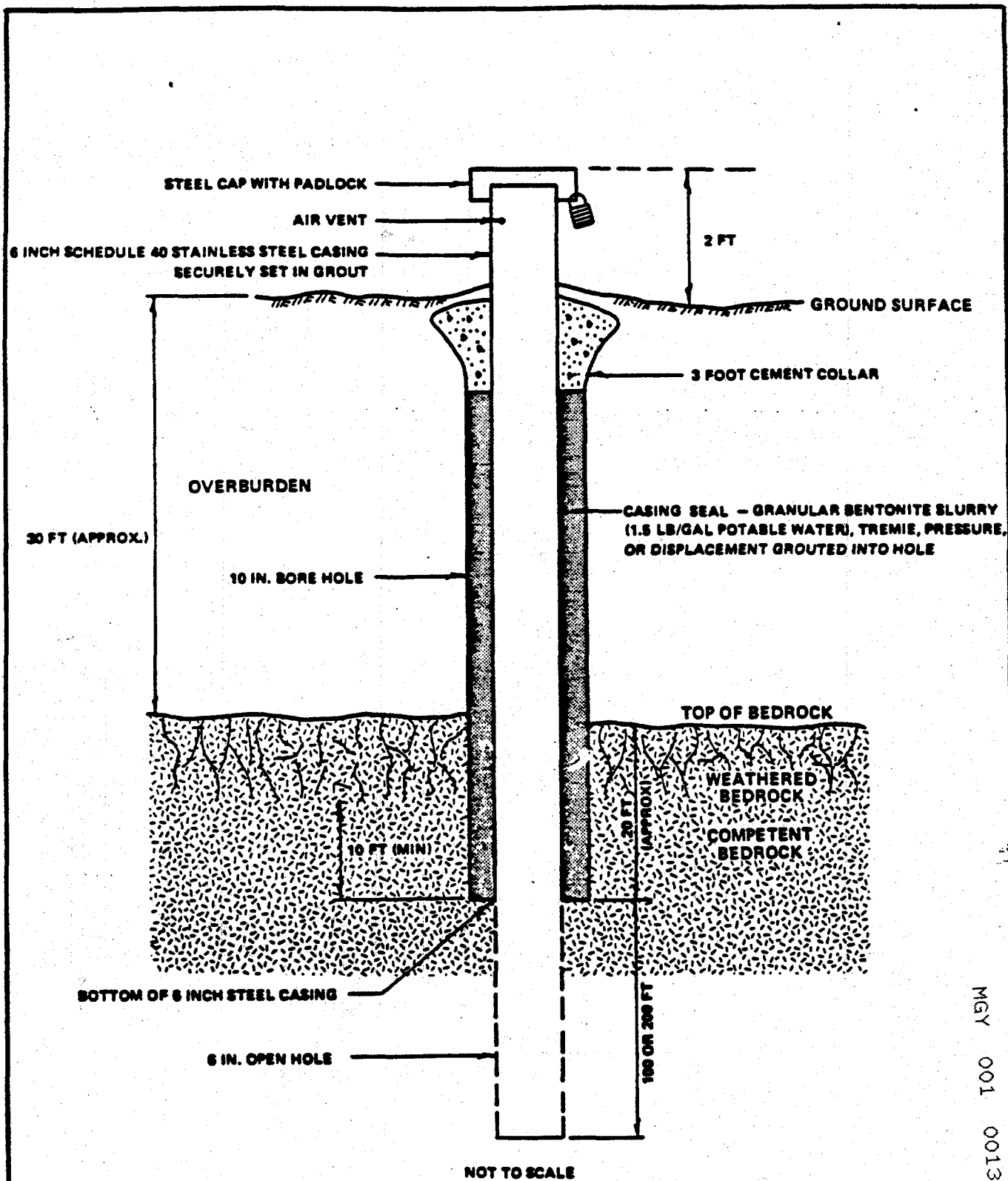
Two of the wells to be installed will be deep wells, approximately 150 ft (MW-19) and 250 ft (MW-11D) in depth. Details of the construction of deep monitoring wells are shown in Figure 3-1, with the exception that MW-19 will be installed with 4-inch diameter stainless steel casing. The remaining wells are expected to be 80 ft deep. Details of the construction of shallow monitoring wells are shown in Figure 3-2.

Drilling will be performed using air rotary and/or rotary wash techniques by Warren George, Inc. of Jersey City, NJ, and inspection will be performed by a WCC field geologist, who will maintain an accurate geologic and time log of each hole. Geologic logs will be maintained according to the WCC SOP Number 4.0 in Appendix A of the QAPMP. Time logs will record the amount of time required to drill a foot of depth. In the course of drilling through the overburden, continuous 2-inch standard split-spoon samples will be obtained. Once rock is encountered, drilling will proceed using a tri-cone roller bit.

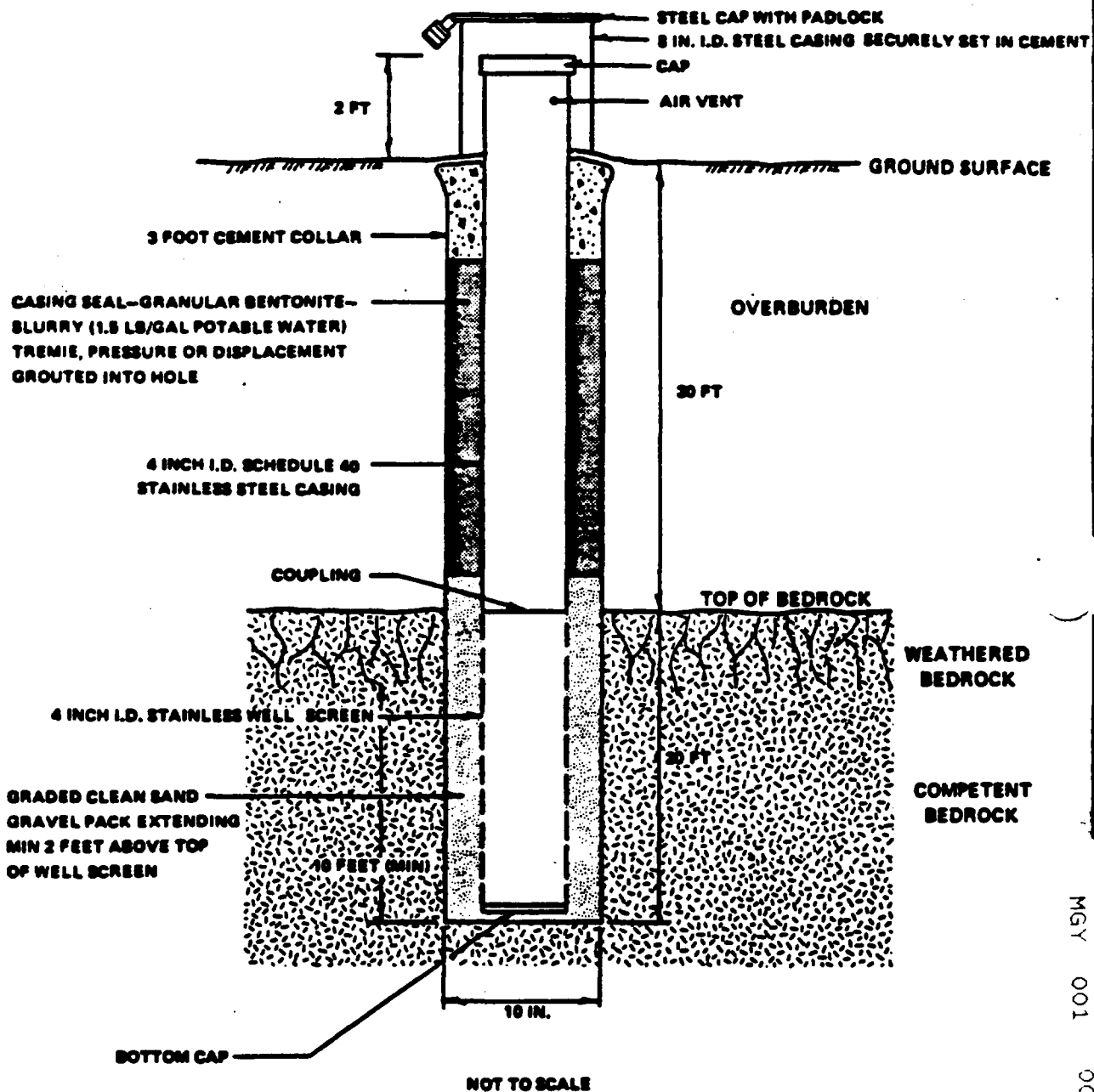
Each monitoring well will be developed upon completion by air or block surging or pumping with a submersible pump until free of cuttings. An organic vapor meter will be used during well development to determine whether it will be required to collect pumped water in 55-gallon drums for disposal off site. The cost of collection, transportation and disposal of such pumped water has not been included in project costs. WCC will contact the NJDEP if it becomes necessary to drum the pumped water. The drilling tools of the drilling rig will be

NO
LOGS
FOR
ONLY

decontaminated, as described in the WCC SOP Number 12.0 of the QAPMP, after the completion of each well to minimize the potential for well cross-contamination.



**SCHEMATIC DRAWING OF TYPICAL DEEP MONITORING WELL
MONTGOMERY TOWNSHIP HOUSING DEVELOPMENT/ROCKY HILL MUNICIPAL WELLFIELD**



**SCHEMATIC DRAWING OF TYPICAL SHALLOW MONITORING WELL
MONTGOMERY TOWNSHIP HOUSING DEVELOPMENT/ROCKY HILL MUNICIPAL WELLFIELD**

SECTION 4

POTABLE WELL SAMPLING

Six potable wells will be sampled during Phase II field investigations (Table 4-1). Four of these wells were sampled during Phase I operations and contained estimated concentrations of tetrachloroethylene. During this Phase, samples from these wells will be analyzed for volatile organics using an instrument detection limit of 1 ppb to verify the presence of tetrachloroethylene. The two new potable wells to be sampled are in Rocky Hill. Samples from these wells will be analyzed for volatile organics at contract required detection limits.

Samples from domestic wells will be collected as close to the well as possible, such as from an outdoor or basement tap. This should minimize the effects of contamination from water-treatment processes or piping. Plumbing piping and any water storage tank between the well and sample source will be evacuated completely prior to sampling. If possible, low pumping rates will be maintained during evacuation to minimize volatilization of volatile organic compounds due to agitation. Evacuation will be terminated when the pH, temperature and conductivity of the water coming from the well are stabilized.

Volatile organic (VOA) samples are to be collected in 40 ml septum vials provided by the laboratory. The vials will be carefully filled with the water sample to the point of overflowing (zero head space) and the screw cap containing a teflon-lined rubber septum will be screwed on tight. The vials will be inspected for any air bubbles. If air bubbles are present, more sample water must be added to the vial until all air bubbles are removed. Filled vials will be cooled on ice and shipped to the laboratory via express mail on the day they are collected.

TABLE 4-1
ROUND TWO POTABLE WELL SAMPLES

Owner	Address	Sample	
		1 ppb detection limit	5 ppb detection limit
Michel	188 Montgomery	1	0
MacDonald	41 Sycamore	1	0
Anderson	86 Sycamore	1	0
Enstrom	81 Sycamore	1	0
Moore	30 Skillman	0	1
Ottey	93 Princeton	0	1

SECTION 5 MONITORING WELL SAMPLING

Two weeks after the new monitoring wells are installed and developed all wells, including those sampled during Phase I, will be sampled for chemical analysis. Samples will be analyzed for volatile organics.

SAMPLING PROCEDURES

Prior to sampling, static water levels will be recorded for each well. Water levels will be measured to 0.01 of a foot using an electronic water level indicator or other appropriate measuring device. The measuring device will be decontaminated after each use. Each well will then be purged of 3 well volumes or completely evacuated prior to sampling. The water level data obtained during this task will be tabulated and contoured.

For each sample, a laboratory cleaned stainless steel bailer with a teflon check valve assembly will be used to collect the ground-water samples. The suspension line attached to each bailer will consist of a 10 foot teflon leader attached to a polypropylene cord which will be kept from contacting ground water.

The first one or two bailerfuls of water retrieved will be used to: (1) fill VOA vials, and (2) provide a sample for the field measurements to be conducted. Subsequent bailerfuls will be used to fill the remaining sample bottles. To minimize the effect of any potential constituent stratification in the water column of the well, a small portion of water will be discharged from the bailer into each sample bottle alternately until all of the bottles are full.

Field measurements will be performed on each sample and include measuring sample temperature, pH and conductivity. Measurement equipment will be decontaminated following each use.

When well sampling has been completed, the suspension cord will be removed from the bailer and disposed of. The bailer will then be sealed in a plastic bag for transport to a laboratory for decontamination.

SECTION 6

SURFACE WATER AND SEDIMENT INVESTIGATION

SAMPLING LOCATIONS AND RATIONALE

Five surface water samples will be collected. This will include three water samples from the Millstone River and two water samples from the brook south of Route 518 which is a tributary to the Millstone River (Figure 3-1 of the original site specific Field Sampling Plan). Sampling of these surface water bodies will provide some indication of whether contaminated ground water is discharged to the Millstone River or its nearby tributary.

The first surface water samples will be obtained at the downstream locations and then obtained consecutively at upstream locations. The background samples (upstream) would be obtained last.

SAMPLING PROCEDURES AND CHEMICAL ANALYSES

Surface water samples to be collected within the upper one foot of water will be obtained by immersing the sample container. Samples will be taken by wading into the stream and filling the sample container. In flowing water, the neck of the sample bottle will be oriented toward the upstream direction. In standing water, surface tension will be broken by slowly swirling the sample bottle in the water prior to immersion. The sample will be collected from below the water surface to minimize collection of surface dirt particles. All bottles will be filled to overflowing and then capped.

Sediment samples will be collected at approximately the same locations as surface water samples by scooping sediment into the sample container.

Care will be taken to exclude vegetation or large (2 mm) non-sediment particles from the sample. Native water on the sample should not be removed.

Surface water samples will be analyzed for priority pollutants plus 40 and sediment samples will be analyzed for volatile organics only.

SECTION 7

SEPTIC TANK SAMPLING

Septic tank samples will be collected from five domestic dwellings and six industrial properties.

SAMPLING PROCEDURES AND CHEMICAL ANALYSES

Septic tank sampling will be done by removing soil from over the tanks access pipe. The soil will be piled onto plastic sheeting during sampling and used to refill the hole after sampling is completed. Once the access pipe has been opened, a sample will be collected by lowering a laboratory cleaned stainless steel bailer with a stainless steel or teflon leader into the tank.

Septic tank samples will be analyzed for volatile organics only. As with all volatile organic analysis samples, the vials will be filled to overflowing and capped so that no air bubbles are present and stored on ice for transport to the laboratory.

SECTION 8

AIR SCREENING

AMBIENT AIR SAMPLING

WCC intends to conduct an air quality survey of potential contamination source locations at the MTHD/RHWW Site. The purpose of this survey is to locate and identify possible sources of volatile contaminants in the area. We propose to sample the air quality at the location of 13 PRPs as identified by the NJDEP Request For Proposal for this project. Possible sources of contaminants in the area will be identified. These would include drains, manholes, industrial areas, material handling and storage areas, known disposal areas, etc. Additional potential sources observed during the survey (i.e., road spills) will also be sampled. Since HNU measurements made during the installation, development and sampling of the monitoring wells did not encounter levels above expected background, we do not anticipate conducting ambient air sampling in residential areas.

The air quality survey will be performed using a photoionization detector (HNU) calibrated to benzene. Since the HNU cannot be used to distinguish specific organic vapors, Draeger colorimetric tubes will be used to identify specific compounds when HNU readings exceed 5 ppm. Based on the first-round of ground-water analyses from the site, we propose to use detection tubes for trichloroethene and vinyl chloride. All sampling will be done during one day to reduce variation in atmospheric sampling conditions.